



Univerza v Mariboru



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Fakulteta za naravoslovje in
matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Vektorska analiza
Course title:	Vector analysis

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Matematika 1. stopnja	Uporabna matematika	3.	5.
Mathematics 1 st degree	Applied Mathematics	3.	5.

Vrsta predmeta / Course type

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
60		30			120	7

Nosilec predmeta / Lecturer:

Bojan HVALA

Jeziki /

Languages:

Predavanja /

Lectures:

SLOVENSKO/SLOVENE

Vaje / Tutorial:

SLOVENSKO/SLOVENE

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

- opravljeni izpit iz predmeta Analiza III

Prerequisites:

exam from Analysis III

Vsebina:

Content (Syllabus outline):

Dvojni in trojni integral. Polarne, cilindrične in sferne koordinate. Uporaba.

Krivulje v ravnini in prostoru. Parametrizacija, tangenta, ločna dolžina. Ploskve v prostoru. Površina.

Skalarna in vektorska polja. Krivuljni in ploskovni integrali. Gradient, divergenca, rotor. Potencialna polja.

Gaussov in Stokesov izrek. Primeri uporabe.

Double and triple integrals. Polar, cylindrical and spherical coordinates. Applications.

Plane and space curves. Parametrization, tangent, arc length. Surfaces. Area.

Scalar and vector fields. Line and surface integrals. Gradient, divergence, curl. Conservative fields.

Divergence theorem. Stokes' theorem. Applications

Temeljni literatura in viri / Readings:

- M. H. Protter, C. B. Morrey: *Intermediate calculus*. New York : Springer, 1985.
- D. Varberg, E. Purcell, S. Rigdon: *Calculus*. Prentice Hall, 2006.
- S. Lang: *Calculus of several variables*, Reading: Addison – Wesley, 1973.
- D. J. Struik: *Lectures on Classical Differential Geometr.* Cambridge: Mass., Addison-Wesley Press, 1950.
- M. Dobovišek: *Rešene naloge iz analize II*. Ljubljana: DMFA, 1996.
- B. Hvala: *Zbirka izpitnih nalog iz analize*. Ljubljana: DMFA, 1996.

Cilji in kompetence:

Spoznati glavna dejstva o krivuljah in ploskvah. Spoznati koncepte integracije po merljivih množicah v ravnini in prostoru ter po krivuljah in ploskvah. Spoznati povezave med obravnavanimi integrali. Seznaniti se z možnostmi uporabe te teorije v fiziki in drugje.

Objectives and competences:

Knowing basic facts about curves and surfaces. Knowing concepts of integration on measurable subsets of plane and space and on curves and surfaces. Knowing basic relations between those integrals. Being familiar with the applications of this theory.

Predvideni študijski rezultati:

Znanje in razumevanje:

- Študent spozna koncept dvojnega in trojnega integrala, se nauči te integrale računati in se seznani s primeri uporabe.
- Študent se seznani z osnovami diferencialne geometrije krivulj in ploskev v prostoru.
- Študent spozna pojme dolžina loka, površina ploskve in jih zna računati.
- Študent se seznani z integracijo skalarnih in vektorskih funkcij po krivuljah in ploskvah in z rezultati, ki te integrale povezujejo. Seznan se tudi z njihovim zgodovinskim ozadjem in primeri uporabe.

Prenesljive/ključne spretnosti in drugi atributi:

- Prenos znanja v zvezi s krivuljami in ploskvami na druga področja (geografija, astronomija, fizika)
- Povezava konceptov skalarnih in vektorskih s konkretnimi problemi v naravoslovju.

Intended learning outcomes:

Knowledge and understanding:

- Understanding the concept of double and triple integral, to be able to compute them and to be familiar with possible applications
- To be familiar with the basic facts about differential geometry of curves and surfaces in space.
- Understanding the concepts of arc length and surface area, and to be able to compute them.
- To be familiar with the concepts of integration of scalar and vector fields on curves and surfaces. To be informed about the background and possible applications.

Transferable/Key Skills and other attributes:

- Knowledge transfer of the concepts, connected with curves and surfaces, into other fields (geography, astronomy, physics).
- Connection of the concepts of scalar and vector fields with concrete problems in

	sciences.
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Metode poučevanja in učenja:

- Predavanja
- Teoretične vaje

Learning and teaching methods:

- Lectures
- Theoretical exercises

Načini ocenjevanja:

Delež (v %) /
Weight (in %)

Assessment:

Pisni test – praktični del Izpit (ustni) – teoretični del Vsaka izmed naštetih obveznosti mora biti opravljena s pozitivno oceno. Pozitivna ocena pri pisnem testu je pogoj za pristop k izpitu.	50%, 50%	Written test – practical part Exam (oral) – theoretical part Each of the mentioned commitments must be assessed with a passing grade. Passing grade of the written test is required for taking the exam.
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Reference nosilca / Lecturer's references:

1. HVALA, Bojan. Diophantine Steiner triples. *Math. Gaz.*, March 2011, vol. 95, no. 532, str. 31-39. [COBISS.SI-ID [18256648](#)]
2. HVALA, Bojan. Diophantine Steiner triples and Pythagorean-type triangles. *Forum geom.*, 2010, vol. 10, str. 93-97. <http://forumgeom.fau.edu/FG2010volume10/FG201010.pdf>. [COBISS.SI-ID [15669337](#)]
3. HVALA, Bojan. Modernizing mathematics education in Slovenia : a teacher friendly approach. V: LAMANAUSKAS, Vincentas (ur.). *Challenges of science, mathematics and technology teacher education in Slovenia*, (Problems of education in the 21st century, vol. 14). Siauliai: Scientific Methodological Center Scientia Educologica, 2009, str. 34-43. [COBISS.SI-ID [17351944](#)]
4. HVALA, Bojan. Generalized Lie derivations in prime rings. *Taiwan. j. math.*, dec. 2007, vol. 11, iss. 5, str. 1425-1430. [COBISS.SI-ID [15969288](#)]
5. BREŠAR, Matej, HVALA, Bojan. On additive maps of prime rings. II. *Publ. math. (Debr.)*, 1999, letn. 54, št. 1/2, str. 39-54. [COBISS.SI-ID [8598617](#)]